A new Vertex-Tracking detector for HADES

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E12

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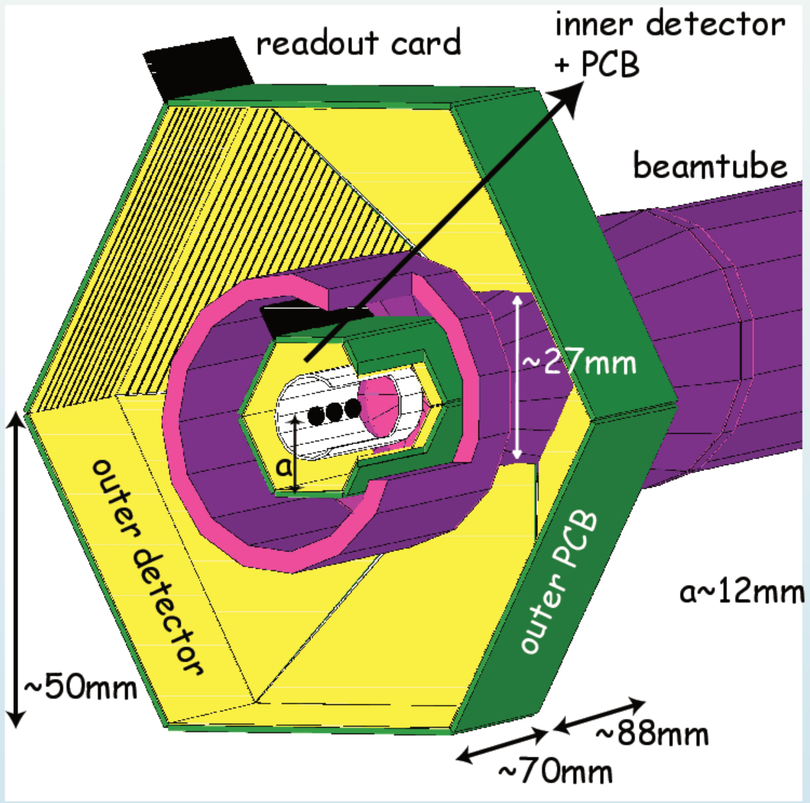
Layout and Dimensions



yellow: 0.3mm detector material (Si / CVD-Diamond)
green: 1mm PCB

Motivation for the Vertex-Tracker

A detector close to the target to measure:

a.) Multiplicity of charged particles
-> LVL1 Trigger for centrality
b.) Time signal -> start for TOF wall
c.) Primary and secondary vertices
in case of high segmentation

Which influence does such a detector have on the HADES performance ?

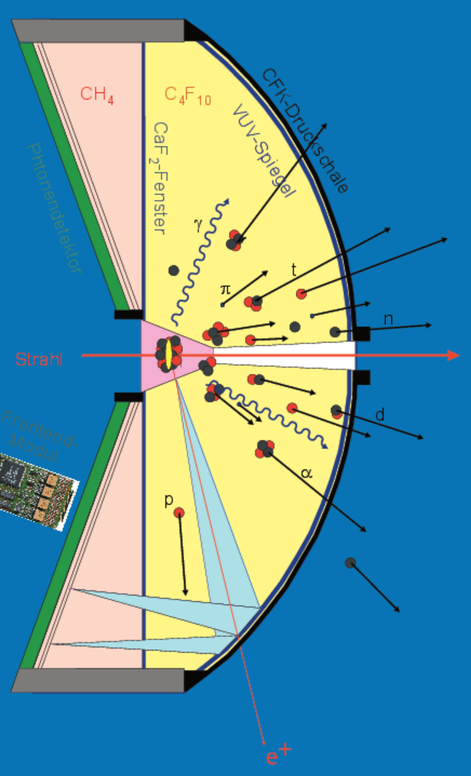
Additional Silicon or Carbon causes:

a.) Creation of e^+e^- pairs due to conversion
b.) Small-angle scattering
c.) δ - electrons

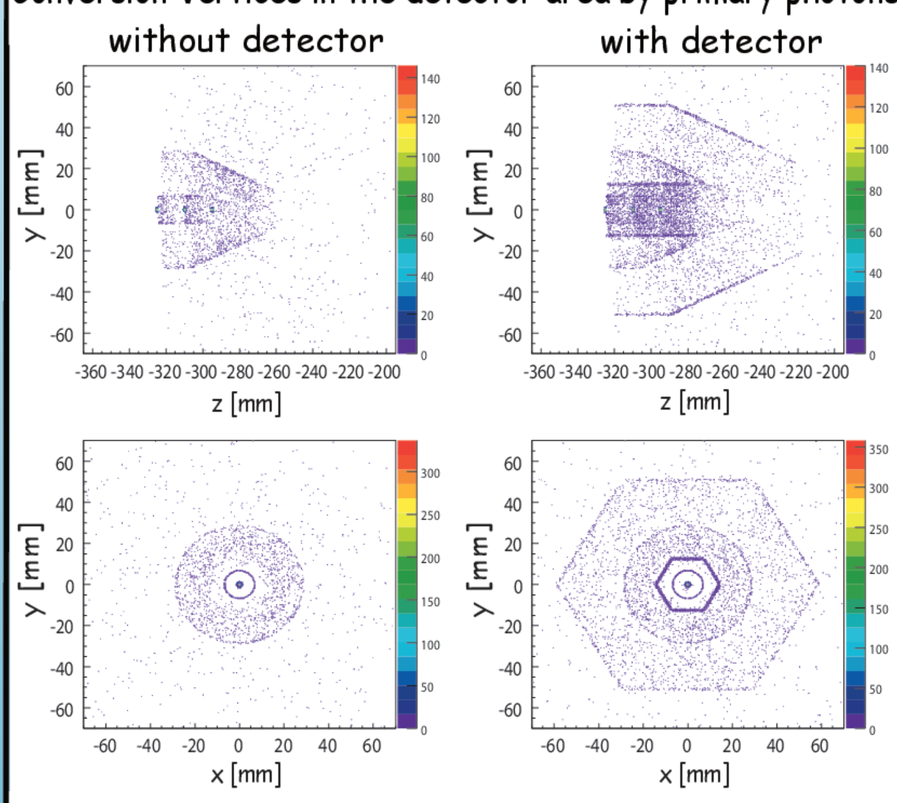
- a.) + c.) → Additional combinatorial background for dilepton pairs
- b.) → worse momentum resolution

Background Contribution

Simulation of 100k events with 5 photons/evt emitted from the target to determine conversion contribution by additional detector in target area.



Conversion Vertices in the detector area by primary photons



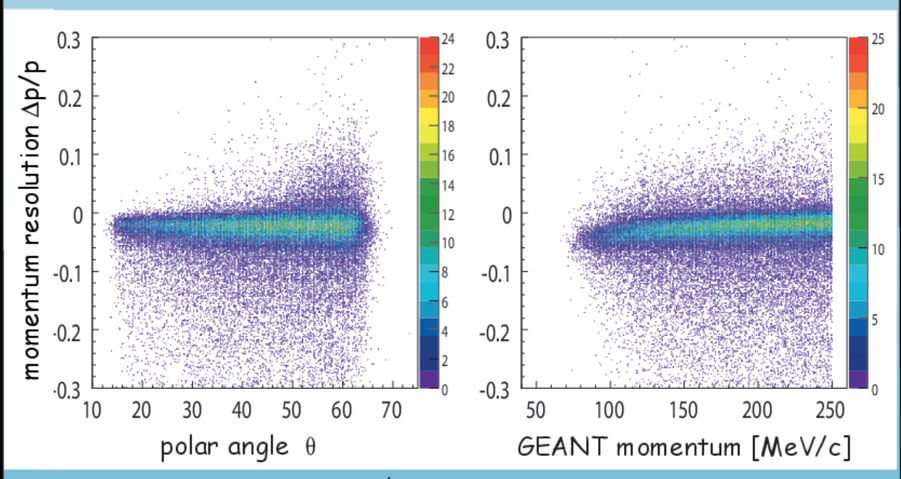
kinematics: θ = 15-85° φ = 0-360° p = 50-250 MeV/c

Results for the background contribution

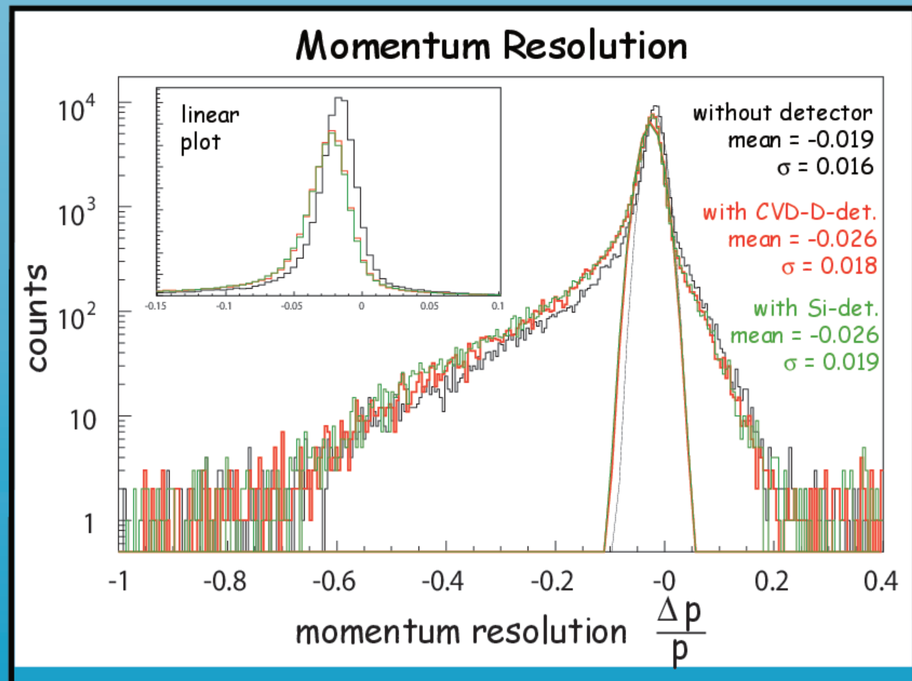
	without detector	with Silicon detector	with CVD-D detector
conversion rate	1.66%	3.91%	3.42%

Momentum Resolution

Simulation of 100k events with 5 e-/evt emitted from the target to determine the deterioration of the momentum resolution due to small-angle scattering.



$\Delta p = p_{rec.} - p$



Results for the momentum resolution

	without detector	with Si detector	with CVD-D detector
mean Δp/p	1.9%	2.6%	2.6%

Conclusion

A feasable geometry for a new Vertex Tracking detector was proposed and simulated.

A new Si- or CVD-D-detector would increase the conversion rate by a factor of 2.4 and 2.1 respectively.

A new Si- or CVD-D-detector would deteriorate the momentum resolution from 1.9% to 2.6%.

Consequently the resulting expected momentum resolution is still sufficiently good for the reconstruction of dileptons.

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